QUALITY ASSURANCE PROJECT PLAN
AND
SAMPLING AND ANALYSIS PLAN

FOR

ENCYCLE/ASARCO OFFSITE SITE
SEDIMENT/SOIL SAMPLING

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DISTRIBUTION

EPA Site Assessment Manager
EPA Houston Laboratory
TCEQ Project Manager

1. INTRODUCTION

The U.S. Environmental Protection Agency (EPA) assisted by the Texas Commission on Environmental Quality (TCEQ) will conduct a soil and sediment sampling event at the Encycle/ASARCO Offsite Site located in Corpus Christi, Texas. More specifically, EPA and TCEQ will collect soil and sediment samples from select locations in or near an area of the Dona Park neighborhood which receives runoff from the former Encycle facility. Samples collected during this sampling event will be packaged and shipped to the EPA Houston Laboratory for analyses.

All environmental monitoring and measurement efforts mandated or supported by the EPA are subject to a centrally managed quality assurance (QA) program. Any party that generates data under the QA program is responsible for implementing minimum procedures to ensure that the precision, accuracy, completeness, sensitivity, comparability, and representativeness of its data are known and documented. Each party must prepare a quality assurance plan (QAPP) and sampling analysis plan (SAP) for the environmental data collection effort.

In response to this requirement, the EPA Site Assessment Manager (SAM) has prepared this combined QAPP/SAP which presents the overall project description, project organization and responsibilities, and QA objectives associated with sampling and analytical services that will be conducted in support of this event. This project-specific combined QAPP and SAP complies with all requirements of (1) *EPA Guidance for Quality Assurance Project Plans (EPA QA/G-5)* (EPA 1998a) and (2) *EPA Requirements for QAPPs for Environmental Data Operations (EPA QA/R-5)* (EPA 1998c) and includes the four major areas and 25 elements that are described in the guidance. This document has been peer-reviewed.

The objectives, procedures, and techniques described in this combined QAPP/SAP are intended to provide general guidance for collecting and analyzing environmental samples at the Encycle/ASARCO Offsite Site.

The former Encycle facility is approximately 108 acres bordered on the north by a ship channel and on the south by the Dona Park neighborhood (see Figure 1). The facility originally produced high-grade zinc for ASARCO from 1941 to 1985. Between 1988 and 2002, Encycle managed a commercial waste management facility treating hazardous and non-hazardous materials for recycling, reclamation, and volume reduction. Encycle filed Chapter 7 bankruptcy in 2003. A Trustee was appointed by the federal bankruptcy court to oversee and remediate the site. Demolition began April 2011 and is expected to be completed in February 2012. Remediation of the site will begin in 2012. TCEQ is overseeing the Trustee's activities and EPA is consulting with TCEQ on all site activities.

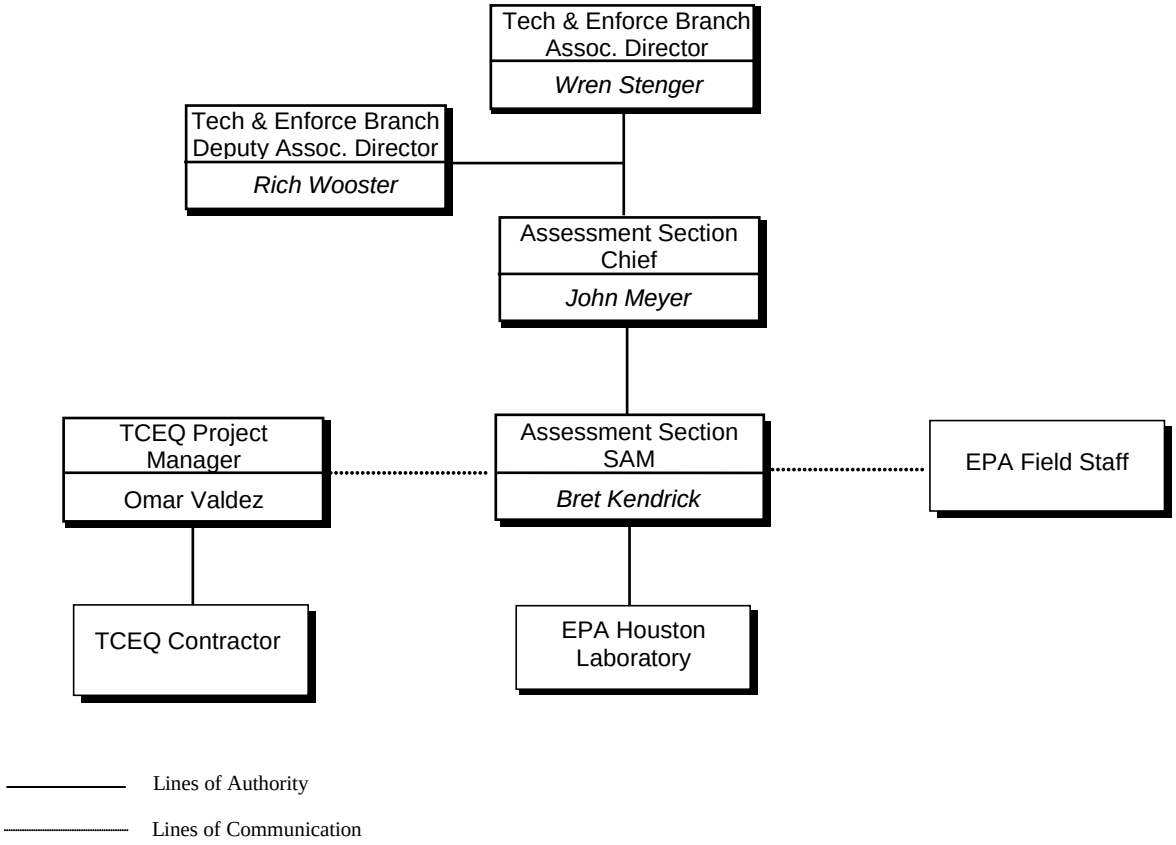
2. GROUP A ELEMENTS: PROJECT MANAGEMENT

This section addresses the key project management components of the sampling and analysis project.

2.1 PROJECT ORGANIZATION

This section identifies the individuals and organizations responsible for the planning and execution of field operations, laboratory services, and data validation and reporting. The project organization is depicted in Figure 2.

Figure 2. Organization for Sampling Event



2.2 PROBLEM DEFINITION

In May 2011, during the analysis of split samples collected by TCEQ from the former Encycle facility, the EPA Houston laboratory detected Aroclor 1268 in sediment samples. This Aroclor is not a routine target of the analytical method utilized for polychlorinated biphenols (PCBs), but the EPA Houston laboratory conducted extra analysis of the samples and confirmed that Aroclor

1268 was present in the sediment samples. In a sediment sample collected from the west lagoon (sample SE-01), Aroclor 1268 was detected at 7.8 milligrams per kilogram (mg/kg). In a sediment sample from the east lagoon (sample SE-02), Aroclor 1268 was detected at 1.9 mg/kg. The 2011 EPA Regional Screening Level (RSL) for Aroclor 1268 in soil is 0.74 mg/kg based on an industrial setting. The RSL for Aroclor 1268 in soil based on a residential setting is 0.22 mg/kg. EPA did not detect any PCB congeners other than Aroclor 1268 in these sediment samples.

Galbestos siding and roofing materials have been widely used at the former Encycle site and some of it is badly deteriorated. Information from other sites in other states has attributed PCB contamination, in particular Aroclor 1268, in soils and sediments to siding and roofing materials identified as Galbestos or similar to Galbestos but under a different trade name. These findings raise concerns about the source of PCBs in the sediment. Relatively high levels of polyaromatic hydrocarbons (PAHs) were also detected in the sediment. PAHs would also be associated with the asphaltic materials used in the Galbestos products prevalent at the site. In sediment sample SE-01 from the west lagoon, PAHs were at concentrations approximately ten times the industrial screening levels and the detections were in excess of the EPA cancer risk range of 10E-04 to 10E-06 for industrial exposure. The sediment was removed from the lagoons during closure operations conducted in 2003 and 2004. There have been no industrial operations since the lagoons were closed. This indicates a source of PCBs and PAHs from other than the industrial processes at the plant. TCEQ conducted a second phase of organic sampling at the former Encycle facility during the week of June 13, 2011. Analytical results from this second phase of sampling confirm that the Galbestos materials used at the former Encycle facility are the source of Aroclor 1268 and a significant source of PAHs.

2.3 PROJECT DESCRIPTION

This QAPP/SAP specifies the procedural and analytical requirements needed to address the sample collection during the sampling event. Results of the analyses of samples will be used to evaluate any impacts to the offsite surface water drainage pathway and residential soils.

EPA will collect samples collected during the sampling event and will submit these samples to the EPA Houston Laboratory, located in Houston, Texas for analysis. The samples will be analyzed for semi-volatile organic compounds (SVOCs) and PCBs.

2.4 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

2.4.1 ACCURACY

Accuracy is the degree of conformity of a measurement to a true value or a known standard and reflects the total error associated with a measurement. Accuracy in analysis is a function of the calibration method. Measurement accuracy is determined by analyzing a standard of known concentration and comparing the measured result to the true concentration. Continuing calibration verifications (CCV), laboratory control samples (LCS), matrix spike (MS) samples, and surrogate spike samples are examples of quality control (QC) procedures that are used to

measure analytical accuracy. The analytical laboratory will provide accuracy acceptance criteria for the project analytical methods.

Accuracy will be expressed and calculated as the percent recovery of a known concentration of analyte added to a field sample. Recovery from spiked samples will be calculated as:

$$\%R = 100\% \frac{S - U}{C_{sa}}$$

where:

%R = percent recovery
S = measured concentration in spiked aliquot
U = measured concentration in unspiked aliquot, and
C_{sa} = actual concentration of spike added.

For situations where a standard reference material (SRM) is used instead of or in addition to matrix spikes, recovery will be calculated as:

$$\%R = \frac{C_m}{C_{srm}}$$

where:

%R = percent recovery
C_m = measured concentration of SRM
C_{srm} = actual concentration of SRM

To the extent practical, spiked samples and LCSs should include all target compounds or analytes for the given analysis. The analytical laboratory will provide acceptance criteria for spikes, LCSs, and surrogate recoveries.

Only project samples will be used for matrix spikes/matrix spike duplicates (MS/MSD). Blanks will not be used for the preparation of MS/MSDs. For each shipment of samples sent to the selected laboratory, sufficient sample volume will be collected and provided with the shipped samples to be used for preparation of the MS/MSD. This sample will include sufficient volume such that one re-extraction/re-analysis of the organic MS/MSD pair or one re-digestion/re-analysis of the inorganic spike may be performed. Alternatively, a sample delivery group system may be established, and sufficient volume for an MS/MSD need only be collected once per sample delivery group.

2.4.2 PRECISION

Precision measures the reproducibility of measurements. It is defined as the degree of mutual agreement among independent measurements as the result of repeated application of the same process under similar conditions. Analytical precision is the measurement of the variability associated with duplicate or replicate analyses. Total precision is the measurement of the variability associated with the entire sampling and analysis process. Total precision is determined by analysis of duplicate or replicate field samples and measures variability introduced

by both the laboratory and field operations. Field duplicate samples and MSD samples are analyzed to assess precision. The analytical laboratory will provide precision acceptance criteria for the project-specific analytical methods.

The principal measurement of precision for the project will be relative percent difference (RPD) obtained from duplicate sample pairs and will be calculated as:

$$RPD = \frac{C_1 - C_2}{(C_1 + C_2)/2} \times 100$$

where:

C_1 = larger of two observed values
C_2 = smaller of two observed values.

Field duplicate samples will be collected at a frequency of no less than 10 percent of the number of field samples collected and of each matrix sampled. To the extent practical, field duplicates will be coded and labeled such that data validation staff can readily identify duplicates but the laboratory cannot.

Laboratory duplicates (including MS/MSD) will be prepared and analyzed for each matrix submitted to the laboratory, as prescribed in the approved method, and at a frequency of no less than five percent of the number of project samples analyzed. Laboratory duplicates will be analyzed concurrently with the associated project samples.

2.4.3 COMPLETENESS

Completeness will be calculated and reported for each method, matrix, and analyte. A completeness goal of 95 percent will be achieved for both field and laboratory activities. Failure to meet completeness goals is an indicator that data gaps exist and the data set is insufficient to support project objectives. The project personnel will require prompt notification by the selected laboratory in the event of sample loss, or if samples are received at the laboratory in a compromised form as a result of shipping damage.

Completeness is generally calculated for each type of measurement/analysis as follows:

$$\%C = 100 \frac{V}{n}$$

where:

%C = percent completeness
V = number of measurements judged valid
n = total number of measurements necessary to achieve a specified level of confidence in decision making.

In addition to completeness goals, critical samples should be identified and appropriate controls maintained to ensure that collected data are of the requisite type, quantity, and quality.

2.4.4 REPRESENTATIVENESS

Representativeness is the degree to which each sample is a valid and true representative of field conditions. It is achieved through use of proper sample collection, compositing, handling, preservation, packaging, transport, and storage practices. Representativeness is also ensured through elements such as proper well locations, drilling and installation procedures, sampling locations, and statistical sampling design. In the laboratory, appropriate subsampling or aliquoting techniques will ensure representativeness. Representativeness will be assessed through results of duplicate field and laboratory samples.

2.4.5 COMPARABILITY

Comparability is the confidence with which one data set can be compared to another data set. The types of matrices sampled and the range of field conditions encountered are considered in determining comparability. Comparability will be achieved by using standardized and consistent methodology, performance conditions, practices, reporting units, and reporting formats.

2.4.6 SENSITIVITY

Sensitivity will be expressed in terms of detection and quantitation limits for each type of measurement/analysis. Detection/quantitation requirements for each analyte and matrix will be determined during the data quality objective (DQO) planning process and specified in the site Quality Assurance (QA) Project Plan in tabular format. Detection/quantitation limits should be compared to the levels proposed within the applicable methods to verify that they are attainable with the specified methodology and instrumentation. The reporting limits will be provided by the analytical laboratory for each analytical method.

Method detection limit (MDL) is defined as follows:

$$MDL = t_{(n-1,\ 1-\alpha=0.99)} \times S$$

where :

MDL = Method Detection Limit

$t_{(n-1,\ 1-\alpha=0.99)}$ = students' t-value for a one-sided 99% confidence level and a standard deviation estimate with n-1 degrees of freedom

S = standard deviation of the replicate analyses.

Where required, method detection studies will be performed in accordance with 40 CFR 136, Appendix B. Normally, seven replicates will be employed for determining MDLs. The laboratory will notify the EPA SAM, prior to project sample analysis, if the laboratory anticipates or experiences any difficulties in achieving the detection/quantitation limits specified by the project leader.

Matrix effects should be considered in assessing the selected laboratory's compliance with sensitivity specifications. The laboratory will provide a detailed discussion of all failures to meet sensitivity specifications in the data package narrative. If a sample dilution results in non-

detected values for analytes that had been detected in the original analysis, the results of the original run and the dilution will be reported with the appropriate notations in the data narrative.

2.5 SPECIAL TRAINING/CERTIFICATION

Personnel will be trained and certified as required to complete the technical aspects of this QAPP/SAP. As appropriate to their responsibilities, project personnel will be proficient in relevant aspects of sample collection, shipping, handling, and analysis; data reporting and management; and the related QC requirements and practices. Each member of the technical staff must demonstrate proficiency with their assigned duties to include the preparation of associated documentation.

Where required, the project personnel will be certified and current in the Occupational Safety and Health Administration (OSHA) Hazardous Material Site Worker Training (40-hour initial training and 8-hour annual refreshers).

2.6 DOCUMENTS AND RECORDS

Field notebooks will be used to record information obtained during the sampling activities. Documentation of sampling activities will be recorded in the field. The following types of information will be recorded in the field notebook:

- Location of activity
- Date and time
- Personnel performing the activity
- Type of personal protective equipment (PPE) used
- Weather conditions (e.g., temperature, precipitation, wind direction, relative humidity)
- Sample type and sample collection method
- Unique sample number
- Description of the sample (e.g., color, odor, clarity)
- Identification of conditions that might affect the representativeness of the sample.

Project personnel will take photographs to document field activities and keep a photographic log in the field notebook.

Chain of custody, which begins with sample collection and terminates upon sample disposal, will be documented throughout the life cycle of each sample using a chain-of-custody form. A chain-of-custody form will be initiated during sample collection and will remain with the samples until receipt in the laboratory. The chain-of-custody record will include the sample numbers, date and time of collection, sampling location, name of the person who collected the samples, preservatives used, and the analyses requested. Each sample transfer will then be documented on the chain-of-custody form.

The analytical laboratory will provide an analytical report to the project leader. The report will be signed by the laboratory director and include a narrative about the analyses, original

completed chain-of-custody forms, and any other documentation received with the samples. The analytical laboratory will also include a summary of the calibration data and laboratory QC data, and raw data (e.g., instrument printouts and manual records). At a minimum, the report will include the following elements:

- Dates of sample receipt, preparation, and analysis
- Condition of samples upon receipt
- Sample preparation and analysis procedures
- Problems encountered during sample handling, storage, preparation, or analysis, and subsequent corrective and preventive actions
- Deviations for approved standard operating procedures (SOPs)
- Discussion of resulting data quality.

3. GROUP B ELEMENTS: DATA GENERATION AND ACQUISITION

This section provides requirements and procedures for sampling design and methodology, sample handling and custody, analytical methodology and acceptance criteria, equipment and material control, and data management.

3.1 SAMPLING DESIGN

The EPA and TCEQ will conduct the sampling event at the Encycle/ASARCO Offsite site during the week of July 25, 2011. During this sampling event, the EPA and TCEQ will collect samples of sediment and soil from various locations selected by EPA and TCEQ. It is not anticipated that samples will be collected from any residential properties during this sampling event. Should a location for a potential sample be selected on a residential property, the property owner be notified and will provide their consent to allow EPA and TCEQ to collect a sample prior to the collection of any samples from their property. Specific sample locations will be identified by EPA and TCEQ on Tuesday, July 26, 2011. A maximum of fifteen (15) soil/sediment samples, including two (2) field quality control (QC) samples will be collected during the sampling event.

Samples collected by EPA and TCEQ during this sampling event will be submitted to the EPA Houston Laboratory, located in Houston, Texas for analysis. Table 1 presents the required analyses for each sample.

Table 1. Sample Matrices, Number of Samples and Analyses

No. of Samples	Sample Matrix	Sample Type	Location	Analyses	Analytical Method and Number
15 (including QC samples)	Soil/Sediment	Grab	To Be Determined	Semi-Volatile Organic Compounds	SW-846, Method 8270D
15 (including QC samples)	Soil/Sediment	Grab	To Be Determined	PCBs	SW-846, Method 8082A

Table 2 lists the applicable technical SOPs recommended for use during the sampling event. Full SOPs for these activities (as listed in Table 2) are included in Appendix A.

Table 2. Technical Standard Operating Procedures

EPA SOP	Title
2001	General Field Sampling Guidelines: http://www.ert.org/products/2001.PDF
2006	Sampling Equipment Decontamination: http://www.ert.org/products/2006.PDF
2012	Soil Sampling: http://www.ert.org/products/2012.PDF
2016	Sediment Sampling: http://www.ert.org/products/2016.PDF

3.2 SAMPLING METHODS

3.2.1 SOIL/SEDIMENT SAMPLING

All soil/sediment sample collection activities will be performed by EPA, TCEQ, and TCEQ contractor field personnel. Sample container, preservation, and holding time requirements are listed in Table 3. Sample containers will be obtained by the TCEQ contractor and will be pre-preserved as necessary.

Table 3. Sample Preservation, Containers, and Holding Times – Soil/Sediment

NAME	ANALYTICAL METHOD	CONTAINER	PRESERVATION	MINIMUM SAMPLE VOLUME OR WEIGHT	MAXIMUM HOLDING TIME
Total SVOCs	SW-846, Method 8270D	1 8-oz glass jar with Teflon-lined cap	Cool to 4 ± 2°C	8 oz	14 days to extract; 40 days after extraction
PCBs	SW-846, Method 8082A	1 8-oz glass jar with Teflon-lined cap	Cool to 4 ± 2°C	8 oz	14 days to extract; 40 days after extraction

The locations sampled, observations, number and type of containers, and requested analyses will be recorded in the field notebook, chain-of-custody form, and field sampling report. These QA/QC records will be managed and retained. Immediately following collection, samples will be placed on ice in a cooler for shipment to the laboratory and will be handled under formal chain of custody from the time the samples are collected through their final disposition.

3.2.2 FIELD QC SAMPLES

QC samples will be collected to ensure sample results are representative of actual field conditions. One duplicate field sample will be collected for every 10 samples. For each type of

equipment that is decontaminated in the field, one equipment rinsate blank will be collected for every 20 samples.

3.2.3 EQUIPMENT DECONTAMINATION

It is recommended that decontamination of sampling equipment be conducted as prescribed in SOP 2006: *Sampling Equipment Decontamination* in Appendix A to assure the quality of samples collected. Any equipment that comes in contact with potentially contaminated soil or waste will be decontaminated. Disposable equipment intended for one time use will not be decontaminated but will be packaged for appropriate disposal. Decontamination will occur prior to and after each use of a piece of non-disposable equipment.

Equipment will be decontaminated in a pre-designated area on plastic sheeting, and clean bulky equipment will be stored on plastic sheeting in uncontaminated areas. Cleaned small equipment will be stored in plastic bags. Materials to be stored more than a few hours will also be covered.

3.2.4 IDW MANAGEMENT

The generation of decontamination fluids will be minimized through the use of disposable equipment and PPE wherever possible. Disposal of investigation-derived waste (IDW) such as personal protective equipment, trowels, and any decontamination fluids will be the responsibility of the sampling team. The IDW will be managed according to U.S. EPA's *Management of Investigation-Derived Wastes During Site Inspections (EPA/540/G-9/009)* and other applicable State requirements and regulations. Disposable sampling equipment and PPE will be bagged and disposed properly.

3.3 SAMPLE HANDLING AND CUSTODY

This section summarizes sample identification, handling, management, documentation, document control, custody, and scheduling requirements. For samples under the control of EPA field staff, the chain-of-custody and sample storage requirements of SW-846 will be followed. Custody procedures will be implemented such that accurate and complete records of sample collection, transfer of samples between personnel, sample shipment, and receipt by the analytical laboratory are generated and retained.

3.3.1 SAMPLE IDENTIFICATION

The EPA field staff will assign and issue a unique sample identification number for each sample collected under his/her purview. Once assigned, the sample number will be included on the sample tag/label and referenced on the chain-of-custody form, the field logbook, and all data reports related to the sample.

A tag/label will be affixed on each sample bottle immediately following sample collection. Information on the sampling tags/labels will include the sample identification number, sampler's name or initials, chemical/physical preservative used, analysis requested, date/time collected, and type of sample.

3.3.2 SAMPLE DELIVERY

The primary point of contact (POC) for sample delivery will be selected by the EPA SAM. The POC will also have primary responsibility for sample labeling and identification. The analytical laboratory will select a POC for both normal business hours and for emergency situations during off-hours.

3.3.3 SCHEDULE

The EPA SAM will coordinate the scheduling of sample collection with the analytical laboratory so as to minimize sample transport and holding time. Samples will be delivered to and received by the analytical laboratory within 48 hours of collection. The turnaround of analytical results from receipt of samples at the laboratory to submittal of results will be based on a standard turnaround, which will not exceed 35 calendar days from date received.

3.3.4 SAMPLE CUSTODY

The EPA field staff will ensure the integrity and security of all samples under their control using a stringent sample custody protocol comparable to the chain-of-custody protocol.

Chain-of-custody, which begins with sample collection and terminates upon sample disposal, will be documented throughout the life-cycle of each sample. A chain-of-custody form will be initiated during sample collection and will remain with the samples until receipt by the laboratory. The chain-of-custody record will include the sample numbers, date and time of collection, sampling location, name of the person who collected the samples, preservatives used, and the analyses requested. Each sample transfer will then be documented on the chain-of-custody form. Copies of completed air bills, if necessary, will be included as part of the final custody documentation.

If samples are shipped via a commercial carrier, at the time that samples are relinquished to the carrier, the person responsible for shipping the samples will perform the following activities:

- Remove all labels from the outside of the cooler
- Sign the chain-of-custody form under “Relinquished By,” enter the name of the carrier organization under “Received By,” and document the date and time of transfer
- Enclose the sheet in a waterproof plastic bag and tape it to the inside top of the sample cooler
- Secure the cooler with strapping tape and custody seals in such a manner that the cooler cannot be opened without disturbing the seals
- Photograph the sealed cooler (if camera is available) and record all the requisite information in the field logbook.

At the time that custody is transferred from the carrier to the analytical laboratory, the laboratory's sample custodian will perform the following activities:

- Indicate the carrier organization on the chain-of-custody form under "Relinquished By"
- Sign off under "Received By" and document the date and time of transfer.

Under no circumstance should there be a break in custody.

Upon receipt of samples by the analytical laboratory, the sample custodian will sign and date the "received by" portion of the chain-of-custody form. The sample custodian will also check the temperature of each ice chest and record this information on the chain-of-custody form and internal traffic log. The pH of those samples intended for inorganic analyses will be checked and recorded after scanning for radioactivity. If an ice chest is found to be warmer than 6°C, the EPA SAM will be notified. In the laboratory, the necessary documentation will be prepared and distributed to all involved analysts, and the samples will be stored in appropriate refrigerators. Access to the samples will be obtained through the sample custodian.

The analytical laboratory's sample management and analytical documentation procedures will satisfy EPA requirements. All samples will be handled under strict chain-of-custody protocol, and in the laboratory, samples and extracts will be tracked and accounted for at all points during processing. The original sample analysis data will be captured in a permanent form, along with the appropriate documentation to support its quality. A sufficient level of redundancy will exist so that all information can be verified from multiple sources.

3.3.5 SAMPLE CONTAINERS AND COOLERS

Sample containers and coolers will be inspected before each use. Sample containers will be selected, prepared, cleaned, and controlled per EPA Office of Solid Waste and Emergency Response (OSWER) Directive #9240.0-05A *Specifications and Guidance for Contaminant-Free Sample Containers* (EPA 540/R-93/051, December 1992). A complete set of sample containers will be prepared by the TCEQ contractor and either shipped to the site in advance of the sampling event or picked up and transported by the contractor field staff. Extra containers will be readily available to project personnel as a contingency for damaged or potentially contaminated containers and for use with samples of opportunity. Sample containers will be kept away from fuels and solvents.

Project requirements will also include the following:

- TCEQ contractor will procure sample bottles prior to the sampling event
- Coolers will be cleaned and decontaminated prior to use
- Coolers will be sealed with custody seals before shipment to the sampling site; the seals must be affixed in such a manner that the cooler cannot be opened without breaking the seals
- Bottles will be certified clean in writing on a per-shipment basis
- The EPA SAM will retain in the project files records concerning the cleaning of sample containers, container shipment to the site, and security of empty containers at the site.

3.3.6 SAMPLE DISPOSITION

The analytical laboratory will be responsible for the proper disposal of all samples and extracts.

3.3.7 SHIPPING

Samples will be hand delivered to the analytical laboratory or shipped at the end of each day of sampling using either Federal Express (FedEx) priority overnight service or UPS overnight service. EPA field staff will ship the samples to the analytical laboratory.

EPA field staff will contact the designated laboratory POC and provide shipping information to include the carrier name and tracking number, the number of coolers being sent, and whether or not these samples are the last ones for the project. The samples collected will remain in the custody of field personnel until relinquished for shipment to the analytical laboratory.

All samples will be placed in a cooler on ice and chilled to 4 degrees Celsius or below for shipping/transport. Sample coolers will contain sufficient ice to maintain required temperature preservation of samples. The ice in the cooler will be placed inside two sealed plastic bags to prevent leakage. All samples will be placed inside sealable plastic bags to prevent cross contamination. All samples in glass jars will be wrapped in bubble wrap to prevent the samples jars from breaking. The chain-of-custody forms will be placed inside a watertight plastic bag and taped to the inside of the cooler lid. The coolers will be sealed and wrapped with strapping tape. Custody seals will be placed on the tops of the coolers to ensure that the samples are not tampered with during shipping. All collected samples will be shipped, via air, or driven to the contracted laboratory in accordance with U.S. Department of Transportation regulations.

3.4 ANALYTICAL METHODS

This section provides routine analytical requirements and procedures that will be implemented for this sampling program.

3.4.1 ANALYTICAL PROCEDURES

The analytical procedures to be used in this sampling program are listed in Table 1 within Section 3.1.

3.4.2 CALIBRATION PROCEDURES

Calibration procedures are specified in each of the analytical methods. All analytes reported will be present in the initial and continuing calibrations. Reported results will fall within the calibration range. Records of standard preparation and instrument calibration will be maintained. Records will unambiguously trace the preparation of standards and their use in calibration and quantitation of sample results. Calibration standards will be traceable to standard materials. Traceability to the National Institute of Standards and Technology (NIST) and EPA standards will be maintained to the maximum extent possible, but the source of calibration will be documented in all cases.

3.4.3 STANDARDS PREPARATION AND TRACEABILITY

Traceability of standards will be accomplished by comparing in-house standards to EPA or NIST materials, and by maintaining the required records. Whenever a standard is prepared, the manufacturer's lot number, the starting materials, the starting amount and volume, the source and volume of the solvent or acid, the date of preparation, and the initials of the technician will be recorded in a permanent, bound notebook. The accuracy of the standards will be established by comparison to previously prepared standards and by comparison to standards prepared independently from different starting materials.

3.4.4 PREPARATION OF SPIKED SAMPLES

The analytical laboratory will document the method used to prepare spiked samples, and the solutions used in sample preparation must be NIST traceable and current, to the maximum extent possible. For many target compounds, however, traceability to NIST may not be possible, and traceability to EPA standards or other nationally recognized standards will be used instead. In such cases, the laboratory POC will consult with the EPA SAM before preparing the spiked samples.

3.5 QUALITY CONTROL

Laboratory QC samples (e.g., blanks and laboratory control samples) will be included in the preparation batch with the field samples. An analytical batch is a number of samples (not to exceed 20 environmental samples plus the associated laboratory QC samples) that are similar in composition (matrix) and that are extracted or digested at the same time and with the same lot of reagents. MSs and MSDs count as environmental samples. The term analytical batch also extends to cover samples that do not need separate extraction or digestion (e.g., volatile analyses by purge and trap). The identity of each analytical batch will be unambiguously reported with the analyses so that a reviewer can identify the QC samples and the associated environmental samples.

3.6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

Field and laboratory equipment will be appropriate and approved for intended uses. The procurement and handling of quality-affecting equipment will be controlled to ensure initial and continued conformance with applicable technical requirements and acceptance criteria. Quality-affecting materials that are to be controlled include, but are not limited to, field and laboratory measurement and testing equipment (M&TE) and sampling equipment.

3.6.1 EQUIPMENT USE AND MANAGEMENT

Equipment will be selected so as to ensure that it is of the proper type, size, tolerances, and sensitivity range to support its intended use. Routine calibration, maintenance, and operation instructions for any field equipment are to be carried out following manufacturers' recommendations.

Equipment used in the execution of work will be appropriate and approved for its intended use, and it will be operated, handled, maintained, and stored in accordance with the manufacturer's specifications. Sample collection and storage equipment will be cleaned, stored, and handled using the necessary precautions against cross-contamination, corrosion, and damage. Table 4 provides restrictions for field equipment selection and use.

Table 4. Field Equipment Selection and Use

EQUIPMENT	USE	RESTRICTIONS
Gloves, Safety Shoes, Hard Hat, first aid kit	Personal protective equipment	Compatible with site conditions and investigations
Sample Containers	Contain samples	Compatible with analyses of concern
Sample Shipment Containers	Contain sample containers for transport from field to laboratory	Capable of maintaining internal ambient temperature of 4ºC ± 2ºC
Bubble Wrap, Packing Material, Polyethylene Bags	Sample storage in shipping container	Compatible with sample containers
Buckets	Washing, miscellaneous	None
Large Polyethylene Bags	Waste storage	Properly disposed
SampleTags/ Labels, Custody Seals, Chain of Custody Forms, Logbooks, Waterproof Pens	Sample Documentation	Use indelible ink; corrections made in accordance with SOPs; initialed, dated
Disposable Towels, Trash Bags	Clean sampling equipment	Properly disposed

3.6.2 INSPECTION AND TESTING

It is recommended that M&TE be calibrated and maintained according to the manufacturer's recommendations. Field equipment will be visually inspected before shipment to the field and again before use. Sample collection and storage equipment will be cleaned, stored, and handled using the necessary precautions against cross-contamination, corrosion, and damage. Equipment, parts, or components that do not meet specifications (i.e., nonconforming items) will be identified in a manner that is easily recognized. These items will be controlled so as to prevent their inadvertent use or installation.

3.6.3 PREVENTIVE AND REMEDIAL MAINTENANCE

Field and laboratory equipment will be maintained on routine preventive maintenance schedules. Preventive and remedial maintenance will be performed and verified by qualified personnel and in accordance with approved procedures and manufacturer's recommendations. Maintenance records will be generated, retained, and reviewed as part of the project quality records.

Maintenance activities will be documented in instrument-specific or field logbooks. Entries should include the following information:

- Equipment identification (e.g., type, model, serial number, and manufacturer)
- Procedure reference
- Date, description, and results of calibration/maintenance
- Name and affiliation of the person who performed maintenance.

3.6.4 STORAGE AND DISPOSAL

Project personnel will ensure the secure and appropriate storage and/or disposal of project equipment and materials under their responsibility.

3.7 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

No sampling equipment or M&TE calibration activities are contemplated for sampling in this QAPP/SAP. It is recommended that the sampling equipment and M&TE calibration activities be conducted and verified by qualified personnel in accordance with any manufacturer's recommendations. Instruments and manufacturer's instructions and specifications will be maintained in the project files. Where available, calibration materials should be traceable to relevant, recognized performance standards.

3.8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Materials used in the execution of work will be appropriate and approved for intended uses. The procurement and handling of quality-affecting materials will be controlled to ensure initial and continued conformance with applicable technical requirements and acceptance criteria. These items will be visually inspected before shipment to the field and again before use. Inspection elements will include, as appropriate, a review of physical condition, expiration dates, limitations of use, size and quantity, and quality grade (e.g., reagents and solvents). Quality-affecting materials that are to be controlled include, but are not limited to, sample bottles, deionized water, disposable sampling supplies, and disposable personal protective equipment (PPE). Materials that do not meet performance specifications will be segregated and labeled to preclude use.

3.9 NON-DIRECT MEASUREMENTS

This section is not applicable to this project.

3.10 DATA MANAGEMENT

The analytical laboratory will provide data in hard copy and in digital format to the EPA SAM.

4. GROUP C ELEMENTS: ASSESSMENT AND OVERSIGHT

Prior to implementation of field activities, the EPA SAM is encouraged to conduct internal readiness reviews to verify that work prerequisites have been satisfied. The readiness review provides a systematic process for assessing, verifying, and ensuring the readiness of the project team to proceed with field activities, such as drilling and sampling. The focus of the readiness review is to ensure that technical and quality procedures have been reviewed for adequacy and appropriateness and approved for implementation; personnel are suitably qualified for the work; and the proper equipment, materials, and resources are identified and available. The readiness review should specifically address readiness issues at the following stages of project planning and execution: (a) during the later stages of project planning (before deployment), (b) at the beginning stages of field work (after deployment), and (c) before resuming field work after a quality-mandated stop work order is lifted or after a prolonged period of stop work due to other causes.

5. GROUP D ELEMENTS: DATA VALIDATION AND USABILITY

The EPA SAM will review the data to ensure that each data set is complete and that there are no gross deficiencies. For the purposes of this QAPP/SAP, it is assumed that EPA will be responsible for field data validation activities. For this field event, the EPA Houston Laboratory will be responsible for analysis of all samples collected. Analytical data will be generated by the EPA Houston Laboratory and provided to the EPA SAM.

5.1 DATA REVIEW, VALIDATION, AND VERIFICATION

The quality and usability of environmental data will be assessed and documented as prescribed herein. The quality of data will be assessed to establish usability for their intended purpose and to foster continuous improvement in data collection efforts by identifying major or recurring sources of error. Data quality assessment will include data review and verification of contract compliance and attainment of DQOs.

For the purposes of this plan, data review is defined as the process whereby the technical merit of data is determined by the organization that generates the data. During this process, achieved QC results are compared to method-specified criteria to determine whether the analyses were performed under controlled conditions. Because data review criteria are based on the analytical methods used to generate the data, the review process and results are independent of the intended use of the data. Before submitting data, the analytical laboratory will be responsible for reviewing their data, implementing corrective actions where possible, and reporting nonconformance and the corresponding corrective actions, as applicable. The EPA SAM will review their data and implement any necessary corrective actions before submitting the data for use.

5.1.1 DATA FLOW AND CHECKING

The analytical laboratory analyst performing the assay will review all results with respect to QC requirements. At least one other qualified individual at the laboratory will further review the compiled results for completeness of the data package and compliance with all contractual and in-house QC requirements. The EPA SAM will provide a final independent review of the completed data package with respect to contract compliance and data usability.

5.1.2 PROJECT-SPECIFIC REQUIREMENTS

Analytical results will be communicated directly from the analytical laboratory to the project leader, and then only to the EPA. In no case will reports, results, or data be released to a third party without prior written permission from the EPA. Disk-deliverable data will be prepared whenever possible by direct electronic transfer from analytical instruments to avoid transcription errors.

5.1.3 REPORTING THE RESULTS OF ANALYSES

Data provided by the analytical laboratory may be supplied in both electronic and hardcopy media. Both reports will consist essentially of a listing specifying the client ID number, the internal laboratory ID number, the sample date, the data prepared and/or analyzed, the method, the matrix, the parameter(s) and the measured concentration(s), units, and the detection limit. QC sample results will be reported in similar format with cross-references to unambiguously relate QC results to their associated environmental samples.

5.1.4 CASE FILE MAINTENANCE AND RECORD TURNOVER

The EPA SAM and the analytical laboratory will maintain requirements for case file maintenance and archiving. The case file will contain the following:

- Internal laboratory chain of custody
- Copy of field sample collection crew's chain-of-custody
- Logbook records (sample preparation, standard preparation, run sequence logs)
- Copies of final internal (laboratory) raw summary sheets from which data are entered
- Information needed to evaluate results (acceptance limits, control charts, detection limits, retention time windows, tunes, percent moisture, corrective actions)
- Instrument printouts, including chromatograms (gas chromatography (GC), gas chromatography/mass spectrometry (GC/MS), liquid chromatography (LC), ion chromatography (IC) spectra of raw responses)
- Internal (laboratory) detail documentation supporting internal QA and assessment, precision, and accuracy (replicates, duplicates, matrix spikes, matrix spike duplicates, trip blanks, control samples, calibration checks).

In summary, documentation must be sufficient to recheck and recalculate reported results at a later date if it becomes necessary. Both electronic and hardcopy data reports will be archived. In all cases, hardcopy printouts will supplement these electronic reports.

5.1.5 DETECTION LIMITS AND REPORTING

The minimum detection limit (MDL) is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. MDLs for each method, matrix, and analyte will be provided by the analytical laboratory. Results less than or equal to the MDL will be reported as the MDL value and flagged.

5.1.6 NOTIFICATION OF LOST SAMPLES, REPORTING ERROR, OUT-OF-CONTROL SAMPLES, OR LOSS OF CAPABILITY

The project leader will notify the EPA of nonconforming conditions that may potentially impact the quality or timeliness of analysis. At the same time, proposed corrective actions will be presented. Nonconforming conditions would include out-of-control results or supporting documentation, inadvertently destroyed or lost samples, or the loss of a laboratory capability that may adversely affect analytical test results.

5.2 VERIFICATION AND VALIDATION METHODS

For the purposes of this QAPP/SAP, it is assumed that EPA will perform the data validation. The analytical laboratory will apply the appropriate data qualifiers if acceptance criteria are not met and corrective action is either not successful or not performed. The EPA SAM will review the data report package and determine if the data quality objectives have been met.

5.3 RECONCILIATION WITH USER REQUIREMENTS

The suitability of environmental data for their intended use(s) will be determined. Data usability involves an evaluation of the quantity, type, and overall quality of generated data against the project objectives. The usability of data that are associated with QC results outside established acceptance criteria is generally dependent on the degree of the exceedance, whether the potential bias is high or low, and whether the uncertainty implied by the exceedance is significant. Usability will be assessed in accordance with the applicable EPA guidance.

APPENDIX A

TECHNICAL SOPs